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NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Statistics and Modelling, 2007

90646 Use probability distribution models to solve straightforward problems

Credits: Four
9.30 am Thursday 29 November 2007

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Make sure you have a copy of the Formulae and Tables Booklet L3–STATF.

You should answer ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–7 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	**Achievement Criteria**		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Use probability distribution models to solve straightforward problems.	Use probability distribution models to solve problems.	Use and justify probability distribution models to solve complex problems.
Overall Level of Performance		

You are advised to spend 40 minutes answering the questions in this booklet.

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SERVICE CENTRE

QUESTION ONE

A road service centre finds that on average there are three callouts per hour for assistance with changing flat tyres. The number of callouts received by the service centre for changing flat tyres can be modelled by a Poisson distribution.

Find the probability that there will be fewer than two callouts received by the road service centre for changing flat tyres in any given **20-minute interval**.

QUESTION TWO

Service centre records show that 5% of all callouts are for changing flat tyres. Assume all callouts for changing flat tyres occur independently.

Calculate the probability that more than two of the next ten callouts are for changing flat tyres.

QUESTION THREE

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Andrew is a mechanic who is employed by the road service centre. The time taken for Andrew to change a flat tyre is approximately normally distributed, with a mean of 12.4 minutes and a standard deviation of 3.0 minutes.

(a) Calculate the proportion of flat tyres that will take Andrew between 10 minutes and 15 minutes to change.

(b) Of all flat tyres, those in the longest 2% of changing times are classified as *difficult*.

Calculate the shortest time it takes to change a *difficult* flat tyre.

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(c) A *fast* tyre change is one that takes less than 8 minutes.

Assuming that *fast* tyre changes occur independently, calculate the probability that two of the next six tyres Andrew changes are classified as *fast.*

(d) The time taken travelling to callouts is normally distributed with a mean of 32.8 minutes and a standard deviation of 11.9 minutes.

As previously stated, the time taken for Andrew to change a flat tyre is approximately normally distributed, with a mean of 12.4 minutes and a standard deviation of 3.0 minutes.

Assume that the time taken travelling to callouts and the time taken for Andrew to change a flat tyre are independent.

Let the random variable T be the total time taken for Andrew to travel to a callout and change a flat tyre.

Find the probability that T is more than 50 minutes.

(e) The road service centre charges $50 per hour that it takes Andrew to travel to a callout and $60 per hour that Andrew spends changing a flat tyre.

Calculate the probability that a callout costs more than $45.

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QUESTION FOUR

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A *slow* callout is one that Andrew can not respond to within an hour. Andrew knows from his experience that 28% of days have at least one *slow* callout.

Let the random variable X represent the number of *slow* callouts on any given day.

(a) The Poisson distribution is to be used to model the distribution of the random variable X. This Poisson model makes some assumptions about the number of *slow* callouts. State clearly two of these assumptions.

(b) Calculate the mean number of *slow* callouts on any given day.

Extra paper for continuation of answers if required.
Clearly number the question.

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Question number

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